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SCIENTIFIC MANAGEMENT AND LABOR WELFARE

In its original conception the Taylor system of scientific management seems to have been literally a system of shop management concerned primarily with the problem of efficient manufacture or productive efficiency in the shop. The problem was to secure the most effective character and use of machinery, tools, and materials, the most effective material and organic arrangements in the shop, and the full co-operative activity of the workers. Mr. Taylor, in his paper, "A Piece-Rate System," presented to the American Society of Mechanical Engineers in 1895, confirmed this idea of the scope and character of the new system by contrasting the care with which managers often "go most minutely into every detail of the buying and selling and financiering, and arrange every element of these branches in the most systematic manner,"¹ with the comparative lack of restrictions as to the principles and methods which the superintendent or foreman is to pursue, either in the management of his men or in the care of the company's plant, and by pointing to the differential piece-rate system of payment as "the means which the writer [Mr. Taylor] has found to be by far the most effective in obtaining the maximum output of a shop, and which, so far as he can see, satisfies the legitimate requirements of the men and the management."²

¹ "A Piece-Rate System," sec. 3 f.

² *Ibid.*, sec. 50.

As time passed, however, the character, scope, and significance of scientific management seem to have steadily enlarged in the minds of Mr. Taylor, his immediate followers, and his imitators, so that when the term "scientific management" was definitely adopted by adherents of Mr. Taylor as descriptive of his system, the intent, apparently, was to emphasize claims for it much broader and more fundamental than those originally made—claims which seem to warrant the following summarization:

1. Efficiency, not only in the mechanical aspects and as it depends on organic arrangements and human effort in the shop, but with respect to the functions of a going industrial establishment, is governed by fundamental natural laws, not made by man, and unalterable by man. And not only this, but the direct relation between productive effort and human welfare, as well as the distribution of the products of industry, is likewise governed by such natural and unalterable laws, i.e., the specific character and amount of work which any laborer can and ought to do, and the proportions of the product which ought to go to management and men and to each individual workman, are thus governed.

2. Scientific management has discovered the *means* by which the facts underlying these natural laws, which govern production in the larger sense—productive welfare and distribution—can be determined and established as objective, matter-of-fact data, quite apart and divorced from human judgment, opinion, or will; i.e., the means by which all productive arrangements and processes, and all the relations between managers or employers and workmen can be reduced to an exact scientific basis of objective fact and law—a means, in other words, in the application of which, human will, judgment, and cunning cannot enter so as to affect the result, and which, therefore, will necessarily reveal the truth in regard to the most efficient arrangement and method, the kind and amount of work which any man can and ought to do, and the share of the product which every factor and every individual ought justly to receive.

It is true that these sweeping claims have never been explicitly stated by authoritative members of the scientific management group in exactly this form, but they seem to be amply warranted

by many spoken and published statements emanating from Mr. Taylor and those claiming to be his adherents.¹ Nor have the members of the scientific management cult pointed out fully the means by which these claims are to be made good. There is strong evidence, however, that both Mr. Taylor and many of his followers have believed that the principal, if not the inclusive, means necessary to the discovery and establishment of the unalterable facts and laws of efficient production and just industrial relationships has been found in the special instrument which has particularly characterized all phases of scientific management, viz., *time and motion study*.

"Scientific management," declared Mr. Taylor, "attempts to substitute in the relations between employers and workers the government of fact and law for the rule of force and opinion. It substitutes exact knowledge for guesswork and seeks to establish a code of natural law equally binding upon employers and

¹ The following quotations are taken from the "Labor Claims of Scientific Management," authenticated by Mr. Frederick W. Taylor at the outset of the writer's investigation of scientific management and labor, made for the United States Commission on Industrial Relations. (*Scientific Management and Labor*, pp. 140-49. The italics are mine.)

"Scientific management is a system devised by industrial engineers for the purpose of subserving the common interests of employers, workmen, and society at large through . . . *the just and scientific distribution of the product.*"

"Scientific management is based upon the fundamental assumptions of harmony of interests between employers and workers. . . ."

"It substitutes exact knowledge for guesswork and seeks to establish *a code of natural laws* equally binding upon employers and workmen."

"Scientific management thus seeks to substitute in the shop discipline *natural law* in place of a code of discipline based upon caprice and the arbitrary power of man."

"Every protest of every workman must be handled . . . and the right or wrong of the complaint must be settled . . . *by the great code of laws which has been developed* and which must satisfy both sides."

"Scientific management guards the workers against overspeeding and exhausting nervously and physically: (a) by substituting exact knowledge for guesswork in the setting of the task; (b) by careful studies of fatigue and the setting of the task on the basis of a large number of performances by men of different capacities and with *due and scientific allowance* for the human factor and legitimate delays."

"The speed of the men is determined by psychological and physical tests and is always set with reference to long-time results."

"Scientific management insures just treatment of individual workers: (a) by substituting the *rule of law* for arbitrary decisions of foremen, employers, and unions;

workmen.”¹ In time and motion study it has discovered and developed an “accurate scientific method by which the great mass of laws governing the easiest and most productive movements of men are investigated. These laws constitute a great code which, for the first time in industry, completely controls the acts of the management as well as those of the workmen.”²

Thus, time and motion study, according to Mr. Taylor, rules out, not only force and opinion from industrial affairs, but bargaining as well. There can be no legitimate bargaining, individual or collective, where the facts have been thus established. “As reasonably,” said Mr. Taylor, “might we insist on bargaining about the time and place of the rising and setting of the sun.”³

But, apparently, according to Mr. Taylor, time and motion study not only *makes possible* the ruling out of force and opinion from industrial affairs, a relatively just distribution of the product and the protection of the worker’s welfare at all points, but, coupled with the fundamental natural laws which govern all industrial affairs and relations, it *actualizes* this possibility.

(b) by giving the workers in the end equal voice with the employer. *Both can refer only to the arbitrament of science and fact.*”

“Scientific management increases the skill, efficiency, and productivity of the workers: (a) by the *scientific selection of workmen* so that each man is set to the highest task for which his physical and intellectual capacity fits him.”

“Scientific management . . . gives a voice to both parties, and substitutes *joint obedience of employers and workers to fact and law* for obedience to personal authority.”

“Time and motion study is the *accurate scientific method* by which the great mass of laws governing the best and easiest and most productive movements of men are investigated. *These laws constitute a great code which, for the first time in industry, completely controls the acts of the management as well as those of the workmen. . . . They substitute exact knowledge for prejudiced opinion and force in determining all the conditions of work and pay.*

“They thus make possible . . . the adaptation of the task to the intellectual and physical capacity of the workers; the payment of the workers in *exact* proportion to their efficiency; the most efficient methods of performing the task . . . *exact cost* accounting, . . . the elimination of ignorant and cut-throat competition.”

“The modes of payment employed by scientific management insure pay according to efficiency . . . secure justice for each worker.”

The following is taken from the record of an interview which the writer had with Mr. Taylor on November 11, 1914: “Taylor, in general, approved my statement of

¹ *Scientific Management and Labor*, p. 140.

² *Ibid.*, p. 147.

³ *Ibid.*, p. 40.

It *makes possible* the assignment of each worker to the task for which he is best fitted, and the safeguarding of him against over-fatigue and over-exhaustion; and because of this same harmony of interests it turns the possibility into reality.

It not only makes possible the removal of the higgling for advantage and the rough and arbitrary discipline of foremen and employers, but it actually eliminates these things.

"Scientific management," declared Mr. Taylor, "democratizes industry. It gives a voice to both parties, and substitutes the joint obedience of employers and workers to fact and law for obedience to personal authority." "No such democracy has ever existed in industry before. Every protest of every workman must be handled by those on the management side, and the right or wrong of the complaint must be settled, not by the opinion of the management or the workman, but by the great code of laws which has been developed, and which must satisfy both sides." It gives "to the

the labor claims of scientific management. He wants more emphasis placed upon the idea of government by law and democracy. He says that people, in general, have not a broad enough idea of scientific management. . . . Taylor emphasizes the notion that scientific management is working out laws in the place of opinion. These laws are not subject to collective bargaining, any more than the tensile strength of steel. . . . In going over my statement of the labor claims of scientific management, Taylor asked to have two changes made: under A-4, 'Scientific management seeks thus to substitute in the shop discipline . . . natural law in the place of . . .' he would add, 'No such democracy has ever existed in industry before. Every protest of every workman must be handled . . . by those on the management side, and the right and wrong of the complaint must be settled, not by the owner, the management, or the workman, but by the great code of laws which has been developed, and which must give satisfaction to both sides.'

Under C-1-a: "Taylor objects to my consideration of time and motion study simply from the standpoint of efficiency and justice to the workers and the improvement of their conditions. He would say: 'Time and motion study is the accurate scientific method by which the great mass of laws governing the best and easiest and most productive movements of men are investigated. These laws constitute a great code which, for the first time in industry, completely controls the acts of the management as well as those of the workmen, etc.'

"Although I thought that I had taken particular pains in my statement of the labor claims of scientific management to bring out clearly and to emphasize the idea of the government of law in the place of force and opinion, as constituting the essentials of the scientific management spirit, Taylor continuously harped on this and upon my failure to grasp this idea, and, therefore, insisted that these changes should be made, in order to give proper emphasis to the idea."

worker in the end equal voice with the employer. Both can refer only to the arbitrament of science and fact."¹

All this and much more is the result of this instrument for the determination of the facts and laws of industry which scientific management claims to have discovered.

There can be little doubt, then, that Mr. Taylor looked upon scientific management as truly scientific in the sense that its productive and distributive policies and methods are based upon unalterable laws of nature and upon facts discoverable, but unalterable, by the management or workmen concerned. In this his followers appear to have been well in accord with him. Moreover, it is evident that time and motion study is the principal means upon which they rely for the discovery of this scientific foundation of scientific management. *Time and motion study, therefore, must be regarded as the chief cornerstone of scientific management, its main distinguishing feature, and the point of departure for any understanding and judgment of its claims, especially with reference to its scientific character and labor welfare.* Let us then examine the nature and uses and effect of this thing.

There seem to be at least two very diverse conceptions of time and motion study. The first is a very narrow one with respect both to its character and to its uses, held in its most typical form by labor generally, adherence to which according to advocates of scientific management leads to much misinterpretation of its real character and uses. The second is a far broader conception, not always recognized by scientific managers themselves, but clearly implicate in the later claims of Mr. Taylor, and in the statements and methods of the more advanced scientific managers, which has apparently developed along with the enlarged and enlarging view of the scope and character of scientific management previously noted.

In its narrower conception, and as understood by labor, generally, time and motion study is looked upon simply and solely as an instrument for task setting and efficiency rating, used thus, in the main, to determine how much can be done by a workman engaged in a given operation, within a given time, and, therefore, to set

¹ *Scientific Management and Labor*, pp. 140-41, 145, 147.

the maximum task accomplishable by him and the group of laborers to which he belongs. Labor thus pictures a cowering workman over whom stands a labor driver. In one hand he holds a split-second watch. In the other he has a sheet of paper on which are set down the elementary motions of which the job is made up, with spaces opposite each in which may be recorded the time taken by the workman to make each motion. The watch is started. The workman jumps to his task. The time taken for each motion involved in the doing of the job is recorded. The operation is then repeated enough times to satisfy the observer that he has discovered the shortest time required by the worker to make each motion. These shortest times are then summed up as the necessary time, and this, with some allowance for human necessities, breakdowns, and delays, is set as the task time.

This, I say, is labor's habitual conception of time and motion study. It is supposed to be employed only or mainly for the purpose of task setting, and it is assumed to be used to set the minimum time or the maximum task to which the laborers can be forced.

This view of time and motion study, however, accords ill with the later and enlarged conception held, apparently, by Mr. Taylor and by many, if not all, of the present members of the scientific management group. Judged by this standard, it is erroneous in two very essential respects.

In the first place, time and motion study, according to this later conception, when used for task-setting purposes, is not designed to discover and set the minimum time or the maximum task, but the scientific time or task, i.e., the reasonable or just task, considering the technical conditions, the character and training of the workmen, the element of fatigue, etc.

In the second place, time and motion study, in its larger conception, is not merely or perhaps mainly a method used for task setting and efficiency rating. On the contrary, in the light of the recent claims based upon its use, made by Mr. Taylor, and of the problems to the solution of which it is apparently being applied by progressive scientific managers, *time and motion must be conceived as little less than a universal method of attempted accurate industrial analysis*, usable, with or without the stop-watch, to

discover, at almost every step of the productive and distributive process, not only the most effective material, organic, and human arrangements, adaptations, and combinations, but the reasonable demands which can be made upon the intelligence and energy of the management as well as the men, and the just apportionment of the product to all the factors and individuals concerned.

To show that this larger conception of time and motion study is not a mere deduction from the claims made by Mr. Taylor, we have only to consider the attitude of some of the advanced scientific managers in regard to its possible uses.

According to statements made by scientific managers, this process of analysis or time and motion study, in the larger sense, should, where possible, begin with the determination of a site for manufacture. The really scientific manager, starting out *de novo*, will consider all available sites with reference to the time and motion expenditure, determined by actual experiment, necessary in securing an adequate supply of proper materials, in the going to and from the shop of the numbers of the different classes of workmen needed or likely to be needed, in the shipment and marketing of the product, etc. Having in mind the character of the productive process, and the most efficient productive arrangements possible, he will then, with regard to the greatest possible saving of waste time and motion, work out, with the utmost care, and with reference to future expansion, the plans for the construction of his plant. This will involve a most careful study of all the general internal arrangements and processes, the most efficient methods of planning the work to be done and of routing it through the shop so that there may be no delay in transmitting orders, no waste carriage of materials and partly finished products, no lost time in the assembly room waiting for delayed parts. With the same ends in view, and in the same manner, he will also determine the most effective placement of machinery, the storage of tools and materials, and the location of the various elements of the office force.

The shop constructed and the machinery installed, he will apply time and motion study in an endless series of experimental tests to determine what possible improvements can be made in machinery and its operation, and in the tools, fixtures, materials,

and specific processes of work. The best feed and speed for each machine, with reference to the different grades of materials, will then be established. The different jobs or processes will be analyzed and reanalyzed, and their elements experimentally combined and recombined, the tools and fixtures changed and rearranged, and all these variations timed and retimed in an effort to discover the most efficient productive combinations and methods.

This time and motion study analysis will extend, it is thus claimed, to every feature and all organic relationships of the mechanical process of production. But it will not stop there. It will be extended to cover the managerial functions and the office work. The duties of the managers, superintendents, and especially of the shop foremen will be analytically studied and reorganized. As a result, the work of the old managerial functionaries will be split up, and new departments with new department heads established. In place of the single old-line foreman, for example, charged with hiring, discipline, discharge, apportionment of work, the setting up of jobs, the determination of speed and feed of machinery, repair of machinery and belting, inspection of the product, etc., there will be a separate head charged with the selection, hiring, adaptation, and discharge of workmen, and a series of functional foremen, each responsible for a particular duty, e.g., a gang boss, a speed boss, a repair boss, an inspector of work, an instructor, a route clerk, a time and cost clerk, a disciplinarian.¹ The methods of storage and delivery of tools and materials, the dispatching of orders from the office to the shop, the purchasing of materials, the marketing of products, and all the methods of accounting will likewise be subjected to time and motion study, in this larger sense, with a view to discovering the most efficient means and methods. All this and much more is time and motion study in the larger conception of the term, which seems to be sanctioned by progressive scientific managers. And not until, through this broader time and motion study, a larger degree of improvement and standardization of the general productive process has been well advanced, should the scientific manager, according to these experts, enter upon time and

¹ It is not intended, of course, to imply that no other factors or considerations enter into the determination of such matters, aside from time and motion study.

motion study in the narrower sense, i.e., putting the time-study men, with stop-watches, over the workmen engaged in a particular job for the express purpose of setting tasks and rates of wage payment.

Nor, under the direction of this really scientific manager, we are told, will this part of the time and motion study correspond to the conception of it held by labor. On the contrary, it will be done in the same spirit and with the same care that we have noted above. It will endeavor to discover by repeated analysis and experimental timing the best character, combination, and arrangement of tools, materials, machinery, and workmen, the most efficient and convenient lighting, heating, and seating arrangements for the workmen, the proper period for continuous operation by them, considering the element of fatigue, the rest periods needed, their most efficient character, combination, and sequence of motions, etc. Moreover, these particular job experiments will not be confined to one man, or to a few of those who are to accomplish the task. Many men will be timed with the idea of discovering, not the fastest speed of the fastest man, but the normal speed which the group can *continuously* maintain. If necessary, hundreds and perhaps thousands of time and motion studies will be made to determine this, before the task is set and the rate established. And whenever a new or better method or combination has been discovered by the time and motion analysis, which is supposed to continue even after the task is set, the whole process of careful and extended timing for task setting will be repeated, and new tasks and rates established reasonably conformable to the new conditions.

Finally, as an integral part of this broader time and motion study, all the results secured by it will be continuously and systematically filed as permanent asset and guide to future action.

Thus conceived, time and motion study appears to be considered a method of analysis applicable to practically every feature of the productive and distributive process, considered apart from its purely financial aspects, a process of analysis applied continuously throughout the life of the establishment. And the scientific management based upon it is conceived to be a perpetual attempt to discover and put into operation the new and continuously develop-

ing technical, organic, and human arrangements, methods, and relationships constantly revealed by it to be more efficient and more equitable. That this broader conception of time and motion study as the essential basis of scientific managements exists, not as a mere dream, but as a practical ideal striven for with the confident hope of realization, the writer can attest from his experiences in the best class of scientific management shops.

So much for the conception of scientific management and of the essential means or methods upon which are based the claims put forward by Mr. Taylor and his adherents and imitators relative to its character and its effect upon the welfare of labor. Let us now consider its possible and actual effects upon labor, granting the reality of this broad conception of time and motion study.

It is evident that the major claims of scientific management relative to labor are closely bound up with the assumption that it is truly scientific in its dealings with labor. It is evident also that this assumption cannot be evaluated and judged on the basis of the fundamental postulates of scientific management, viz., that productive efficiency and just distribution of the product are governed by natural laws, not made by man, and unalterable by man, and that a fundamental harmony of interests exists between employers and workmen. These assumptions might be true, and still scientific management would not be scientific in practice until it had discovered and based itself on the objective facts and laws upon which these assumptions rest. The practical question, then, whether scientific management is actually scientific becomes, to all intents and purposes, the question whether it *has*, in fact, discovered a means by which all productive arrangements and processes and all relations between employers and workers can be reduced to a basis of exact objective fact and law, a means, in other words, in the application of which human will, judgment, and cunning cannot and will not enter so as to affect the results, and which, therefore, will necessarily reveal the truth in regard to the most effective productive arrangements and methods, the kind and amount of work which any man can and ought to do, the share of the product individuals ought justly to receive relative to each other, the savings effected, and prevailing wages. Time and motion

study, as we have seen, is supposed to be the most effective means to these ends. Let us then discuss it briefly from this standpoint.

In considering this question, we must carefully distinguish between two factors or elements which enter into the industrial process, the mechanical or material, and the human.

With respect to the first of these elements, the claim of scientific management seems to be fairly justified. Through time and motion study in its broader conception, it appears to be possible to discover and to establish in practice the objective facts and laws which underlie the most efficient mechanical arrangements, processes, and methods of production in the shop.

The moment, however, that the conception is broadened and the human factor enters into the situation, and the problem becomes one of setting each man to the work for which he is best fitted, determining how much work any man ought to do, the claims of scientific management with respect to time and motion study, and, therefore, with respect to the character and effects of scientific management, do not seem capable of practical realization.

Not only does it appear that the fundamental basis for these claims is lacking in the absence of discovered laws applying to such matters, but careful consideration shows that time and motion study, applied to the determination of the facts in this connection, is not capable of yielding objective results, uninfluenced or uninfluenceable by human will and judgment. On the contrary, the methods and results of time study used for task setting and rate making are, in fact, the special sport of individual judgment and opinion, subject to all the possibilities of diversity, inaccuracy, and injustice that arise from human ignorance and prejudice.

Fundamentally, the task set themselves by the scientific managers where the human element is concerned seems impossible of attainment, at least in the present or in the near future. Psychologists have, perhaps, developed a technique to determine which of two men is better able at a given time to perform a new task, but they have no technique as yet for determining which of two men would finally become the better worker at the task, or for deter-

mining in what task any man would reach his greatest development. Moreover, no definite laws have been discovered which, in the case of the individual worker, can be applied to solve the problems of fatigue and efficiency, much less any which reveal the long-time effects of any amount of work upon the worker.

The problem of relative productiveness and just distribution is still farther from scientific solution. It is possible, by time and motion study, to determine the relative productiveness of two workers engaged in the same task, provided all the conditions are identical, but it is not possible thus to determine the relative productiveness of two workers engaged in different lines of work involving different productive elements. Here qualitative factors enter into the problem. And this alone makes evident the impossibility of determining, by means of time and motion study, the relative productivity of the capital, the managerial factor, and the labor, which together turn out a given product; the impossibility, therefore, of determining, by time and motion study, the law or laws of the just distribution of the product among these factors. Here the qualitative element is supreme, and the problem has thus far baffled human ingenuity.

But even in the effort to disclose the simple objective facts of human productiveness, uninfluenced by human will and judgment, and to use these facts as a basis for fair task setting, the method of time and motion study proves on careful analysis to be altogether inadequate. Such analysis shows that at a score of points in this process the judgment of the employer, the time-study man, or the workers may be and is exercised so as to produce variations that will affect and alter the task itself. In other words, the time-study process includes a score of factors variable with the judgment and will of those concerned, variation in any or all of which acts as a determinant of the factual results, thus belying the claim that time and motion study is a method by which the objective scientific facts concerning the amount of work or the extent of the task which any man or any group of men can and ought to perform may be scientifically demonstrated, if by this is meant that the results thus obtained are objective scientific data unaffected by human will and judgment.

Analysis shows that among the factors that may vary, subject to human will, and that thus do affect the results of time and motion study used for task setting, are:

1. The general attitude, ideals, and purposes of the management, and the consequent general instructions given to the time-study man.

2. The intelligence, training, and ideals of the time-study man.

3. The degree to which the job to be timed and all its appurtenances have been studied and standardized, looking to uniform conditions in its performance for all the workers.

4. The amount of change thus made from old methods and conditions of performance, e.g., the order of performance, the motions eliminated, and the degree of habituation of the workers to the old and the new situation when the task is set.

5. The mode of selection of the workers to be timed, and their speed and skill relative to the other members of the group.

6. The relative number of workers timed, and the number of readings considered sufficient to secure the results desired.

7. The atmospheric conditions, the time of day, the time of year, the mental and physical conditions of the workers when timed, and the judgment exercised in reducing these matters to the "normal."

8. The character and amount of special instruction and special training given the selected workers before timing them.

9. The instructions given to them by the time-study man as to care and speed, etc., to be maintained during the timing process.

10. The attitude of the time-study man toward the workers being timed, and the secret motives and aims of the workers themselves.

11. The judgment of the time-study man as to the pace maintained under timing relative to the "proper," "normal," or maximum speed which should be demanded.

12. The checks on the actual results used by the time-study man in this connection.

13. The method and mechanism used for observing and recording times, and the degree of accuracy with which actual results are caught and put down.

14. The judgment exercised by the time-study man in respect to the retention or elimination of possible inaccurate or "abnormally" high or low readings.

15. The method used in summing up the elementary readings to get the "necessary" elementary time.

16. The method employed in determining how much should be added to the "necessary time" as a human allowance.

17. The method of determining the "machine allowance."

That the factors thus enumerated are not constant in practice, and that the tasks thus set by time and motion study have no necessary scientific relation to what the members of a working group can or ought to accomplish, but are dependent chiefly upon the judgment of the time-study man, I can positively affirm as the result of many careful observations of time studies for task setting made in scientific management shops, and much analysis and discussion of results with scientific managers and time-study men. Especially is this true of the mode of selecting the workers to be timed, and their speed and skill relative to the workers of a group, and of the methods of summing up the elementary readings to get the necessary elementary time. In these vital matters there are no generally observed rules, but each shop is likely to be a law unto itself. Nor does consistency prevail in the same shop, the result being that the task set may, and sometimes does, mean anything from the output of the "swift" to a "fat job" even for the plodder.

Such being the facts, however *scientific* scientific management may be in its technical and mechanical aspects, it is little less than absurd to speak of it as scientific outside of these spheres. It is not, and apparently cannot be, scientific in task setting. Indeed, under the general circumstances which prevail in industry, the very conception of a single task set for a whole group of workers or of an invariable task for an individual to be accomplished from hour to hour and day to day is unscientific, looked at from the standpoint of adapting the work to the individual capacities of the workers, or from that of strict justice. Nor, if our analysis has been correct, can scientific management be scientific in the matter of rate making, the distribution of the product, or, in fact, in any of its dealings with the human element. Its claims, therefore, relative to the

discovery of objective scientific facts where working relations are concerned, which are not proper subjects for bargaining, and relative to the discovery and establishment of natural laws governing all the dealings of employers and workers, which cannot be violated or which insure justice in effort demanded and in wage payment, seem to have no legitimate foundation.

As the result of the lack of a scientific basis for scientific management and of anything in the system itself capable of preventing violation of its own standards, in matters which concern human conditions and relations, we find that in actual practice the relations of scientific management to the workers are, in the main, as elsewhere in industry, determined by the ideals and intelligence of the particular management, the exigencies of the particular shop, and the general industrial situation. No safe generalizations can, therefore, be made in regard to most of its dealings with the workers. Some of the managers are high-minded and intelligent, and their immediate relations to their workers are marked by liberality and fair dealing. Others are just ordinary, morally and intellectually, with the results that might thus be expected. It is not impossible to find men calling themselves scientific managers, and assuming to put into operation the Taylor, Gantt, or Emerson systems, whose sole or main intent seems to be to use scientific management methods to get as much as possible from, and to give as little as possible to, the workers. The movement is still in its infancy, and, in some respects, is, at best, still crude and inadequate in its dealings with the men. There is no doubt that adherence to Mr. Taylor's ideal of the strict maintenance of standard conditions of work and pay, as long as the efficiency conditions are not altered, marks a distinct advance in the interests of labor over the ideals which have been wont to govern the relations of employers to unorganized labor. On the other hand, it is an unfortunate fact that scientific management at the present is desperately fake-ridden, and where the fakirs—experts or managers—are in the saddle, the results justify every charge that the workers hurl against the movement. Thus, in actual practice, scientific management varies from good, fair, and liberal through every gradation to bad and positively oppressive, in its methods and results, with

respect to the selection and hiring of workmen, the adaptation, instruction, and training of workers, time study and task setting, rate making, modes of payment and maintenance of rates, protection of workers from overspeeding and exhaustion, opportunities offered for advancement and promotion, modes of discipline, methods of discharge, length of service, etc.

There are, however, at least three matters of vital general concern to the workers and society with respect to which safe generalizations with regard to scientific management seem to be possible.

a) First, scientific management has in it possibilities of enormous increase of productive efficiency. In time and motion study, broadly conceived, it has apparently discovered a means such as we have never before had for the systematic, continuous, and indefinite improvement of productive processes and methods. Moreover, if properly guarded and guided, this method may be used very effectively without entailing any evil results to the workers in the way of overspeeding and exhaustion. Scientific management, therefore, not only holds out possibilities of substantial benefits to labor, but it points the way toward raising the standard of living of all classes of labor and of society at large. No one who has grasped the import of the analysis which I have tried to give of time and motion study in its broader conception can, for a moment, doubt this statement.

b) Secondly, scientific management, as it actually exists, is, in spirit and results, undemocratic in so far as we associate industrial democracy with labor organization and collective bargaining. It generally tends to weaken the competitive power of the individual worker, thwarts the formation of shop groups, and weakens the solidarity of those which exist. It is generally lacking in the arrangements and machinery, which, considering the workers' experience and psychology, seem to be necessary for the actual voicing of their complaints, and for the consideration and adjustment of their grievances, except as individuals. Collective bargaining has ordinarily no place in the determination of matters considered by organized labor to be vital, and the attitude toward collective bargaining is usually tolerant only when it is not understood. Unionism, where it means a vigorous attempt to enforce

the viewpoint and claims of the workers, is generally looked upon with abhorrence. A few of the adherents of scientific management are democratic in spirit and purpose. Some think themselves democratic, but analysis of their ideals and attitudes shows them to be in reality adherents of a benevolent industrial despotism. More are definitely committed to an autocratic attitude. But, whatever the spirit of the management, scientific management, *in practice*, by virtue of its most essential and characteristic feature, time and motion study, tends apparently, inevitably, to the elimination of what are considered by the organized workers as democratic arrangements and possibilities. The cogent reasons for this conclusion will appear immediately.

c) Finally, scientific management, *in its essential nature* and unsupplemented, seems to be a force tending to reduce the great body of workers to a little-skilled, practically interchangeable and unorganized mass, with all this implies with respect to possible insecurity and discontinuity of employment, wage leveling, and the mental and moral quality of the workers.¹

Scientific management, at its best, furthers the modern tendency toward the specialization of the workers. Its most characteristic features—functional foremanship, time and motion study, task setting, and efficiency payments—all have this inherent effect.

Functional foremanship means that the worker is to have taken from him much that he formerly had to perform in connection with the particular task. It projects the managerial activity down into every phase of shopwork. As Mr. Taylor says, it effects a more equal division of the work between the management and the men by taking from the latter much of the work which they were formerly obliged to perform. Under scientific management, as fully developed, the machine hand is intended to be, and is, in fact, a machine feeder and a machine feeder only, with the possibility of auxiliary operations clearly cut off; and what applies to the machine feeder applies with more or less thoroughness to machine and hand operatives generally.

¹ I cannot indicate this more clearly than by reproducing in condensed form the discussion of this subject embodied in the report on scientific management and labor made to the United States Commission of Industrial Relations.

But it is not merely in sweeping from the job its auxiliary operations that scientific management tends to specialize the work and the workers. Time and motion study, the chief cornerstone of all systems of scientific management, tends inherently to the narrowing of the job or task itself. The chief function of time and motion study, as we have seen, is the analysis of work, the reduction of operations to their elementary motions and units, and the recombination of these elements into operations more quickly and easily performed. Its preponderating tendency is to split up the work into smaller and simpler operations or tasks, and to further the invention of new machinery of a more automatic type, and of machinery for the performance of former hand operations.

With functional foremanship lopping off from the job the auxiliary operations, and time and motion study tending to the narrowing of the task itself, task setting and efficiency methods of payment come into play as forces tending to confine the worker to a single task or narrow range of operations. The worker is put upon the special task for which he seems best adapted, and he is stimulated by the methods of payment employed to make himself as proficient as possible at it. When he succeeds in this, to shift him to another task, ordinarily involves an immediate and distinct loss to the employer and to the workman himself.

This inherent tendency to specialize is buttressed, broadened in its scope, and perpetuated by the progressive gathering up and systematizing, in the hands of the employers, of all the traditional craft knowledge in the possession of the workers. With this information in hand, and functional foremanship to direct its use, scientific management claims to have no need of craftsmen in the old sense of the term, and, therefore, no need for an apprenticeship system, except for the training of functional foremen. It therefore tends to neglect apprenticeship except for the training of the few.

But scientific management is not only inherently specializing, it also tends to break down existing standards and uniformities set up by the workmen, and to prevent the establishment of stable conditions of work and pay. *Time and motion study* means constant and endless change in the methods of operation. No sooner is a

new and better method discovered and established, and the conditions of work and pay adapted to it, than an improvement is discovered, involving, perhaps, new machinery, new tools and materials, a new way of doing things, and a consequent alteration of the conditions of work and pay, with perhaps a complete reclassification of the workers. Change and more change is the special purpose and mission of this essential instrument and central feature of scientific management.

Certain conclusions inevitably follow. Scientific management, fully and properly applied, tends to the constant breakdown of the established crafts and craftsmanship, and the constant elimination of skill in the sense of narrowing craft knowledge and workmanship, except possibly for some members of the managerial staff and the lower orders of workmen.

Under these circumstances, the progressive degeneration of craftsmanship and the progressive degradation of skilled craftsmen, under scientific management, would seem inevitable, unless some means can be found for their preservation and development outside the shop.

What this means in increased competition of workman with workman can be imagined. Were the scientific management ideal, as at present formulated, fully realized, any man who walks the street might be a practical competitor for almost any workman's job. Such a situation would inevitably break down the basis of present-day unionism in its dominant form, and render collective bargaining, as now practiced, impossible in any effective sense in regard to the matters considered by the unions as most essential.

Granting the correctness of this interpretation, the more ultimate effects of scientific management, should it become universal, upon wages and employment are matters of pure speculation. It is apparent, however, that the highly trained workers cannot hope to maintain their wage advantage over the semi-skilled and less skilled workers. The tendency will be toward a realignment of wage rates. Whether this leveling will be up or down, it is impossible to say. At present, the writer believes that scientific management is making the relatively unskilled more efficient than ever before, and that they are generally receiving under it greater earn-

ings than ever before. It is evident, however, that the native efficiency of the working class must suffer from the neglect of apprenticeship if no other means of industrial education is forthcoming.

If generally increased efficiency is the result of scientific management, unemployment would, in the end, seem to become less of a menace. But during the period of transition, we should expect its increase. Moreover, the whole scheme of scientific management, especially the gathering up and systematizing of the knowledge, which was formerly the possession of the workers, tends enormously to add to the strength of capitalism. This fact, together with the greater ease of replacement, must make the security and continuity of employment inherently more uncertain.

Scientific management, then, like the progressive invention of machinery, seems to be a force urging us forward toward an era of specialized workmanship and generally semi-skilled or less skilled workmen. Here we glimpse the great problem with which its spread and development confront labor and society. What, then, is the solution of the problem thus presented?

I cannot believe that it lies in repressive measures. We surely cannot afford to give up the vast possibilities of increased productiveness which scientific management holds out. On the contrary, "our industries should adopt," and should be encouraged to adopt, "all methods which replace inaccuracy by accurate knowledge, and which systematically operate to improve productive methods and eliminate economic waste." The remedy, then, is not repression, but supplementation.

The need is a method by which the intellectual and moral content which the worker is losing through the destruction of his craft training and the loss of his craft knowledge can be restored to him. How can we secure this? It will not do, I take it, to demand this of scientific management. To attempt to limit specialization and restore the old apprenticeship system in the shop would mean to prevent to a large degree the productive effectiveness and the productive improvements which we cannot afford to forego. Moreover, to require that scientific managers themselves maintain training schools for all their workers, effective in a social sense,

would severely penalize and handicap, if it did not eliminate, the system.

Nor do we wish the training of the workers to be centered in the hands and under the control solely of the employers. It seems that what we really need, as a supplement to scientific management—so that we may avail ourselves of its beneficial possibilities and eliminate or minimize its possible evil effects—is an adequate system of industrial education, socially launched and socially controlled—an integral part of our public-school system. With such a system in vogue, we might hope, I believe, that what the workers lose intellectually and morally in the shop, under modern specialized workmanship, they would gain in the school, and that through this moral and intellectual gain they might become universally organizable and organized, and might develop policies and methods which, while not interfering with productive efficiency, would secure for them as a class improved conditions and a reasonable share in the increased social dividend which the development and spread of scientific management promises.

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